

I. Rejection under 35 U.S.C. §103(a)

Claims 1-10 and 12-19 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over in U.S. Patent No. 5,206,192 (Dransfield) taken together with in U.S. Patent No. 5,945,369 (Kimura). This rejection is respectfully traversed.

Applicant submits that the particles of Dransfield are inappropriate for use as an exhaust gas catalyst with a noble metal loaded thereon. Contrary to the assertions in the Office Action, one of ordinary skill in the art would not have been led by Dransfield or Kimura to load noble metal onto the metal oxide ceramic particles of Dransfield to form an exhaust gas catalyst.

Dransfield teaches a metal oxide suitable for the manufacture of ceramics and ceramic products. See col. 1, lines 52-57. The metal oxide particles comprise zirconia particles coated with a hydrous oxide of cerium and a hydrous oxide of lanthanum, neodymium or praseodymium. See col. 1, line 66 to col. 2, line 3. Dransfield does not teach or suggest that the metal oxide particles may be used as an exhaust gas catalyst material, or that the particles have any properties making the particles suitable for use as catalysts in an exhaust gas environment. As such, there is no motivation to have led one to have used the ceramic-making particles of Dransfield for exhaust gas purification by loading a noble metal thereon as in the present application.

In fact, the metal oxide particles of Dransfield would have been recognized by practitioners in the art to have properties inappropriate for use as a material supporting a noble metal as with an exhaust gas catalyst. Specifically, one of ordinary skill in the art would have recognized the metal oxide particles of Dransfield to be non-uniformly coated with ceria, and further to have an inadequately low surface area for use in supporting noble metal for use as an exhaust gas catalyst.

The particles of Dransfield are prepared by adding a water-soluble hydrolysable compound of cerium to an aqueous dispersion of particulate zirconia to form a dispersion, and raising the pH of the dispersion to precipitate the coating of hydrous oxide of cerium on the zirconia particles. In particular, in Example 1, an aqueous solution of cerium sulfate is added to a dispersion of zirconia particles, and the pH is raised with ammonium hydroxide to a value of 8.5 to obtain ceria/zirconia powder. In the process of adding ammonium hydroxide,  $\text{Ce}^{+4}$  ion becomes  $\text{Ce}(\text{OH})_4$ , and  $\text{Ce}(\text{OH})_4$  is adsorbed on the zirconia particles by way of OH groups. However,  $\text{Ce}(\text{OH})_4$  condenses to form  $\text{CeO}_2$ , and therefore at the time of adding ammonium hydroxide,  $\text{Ce}(\text{OH})_4$  does not adsorb on the surface of the zirconia particle.  $\text{CeO}_2$  aggregates easily, and therefore it is difficult to coat the surface of zirconia particle with ceria uniformly. Further, the aggregated  $\text{CeO}_2$  has low surface area, and therefore the particles of Dransfield are not suitable for use in supporting a catalyst material. On the other hand, the particles of the present application use ceria sol, which is hard to aggregate compared to  $\text{Ce}(\text{OH})_4$ , and therefore ceria is coated on the surface of the zirconia particle uniformly, and the surface area is suitable for supporting a catalyst.

Due to the low surface area of the metal oxide particles of Dransfield, one would not have been led to have used such metal oxide particles to support a noble metal. As explained on page 10, l. 28-32 of the present application, the present metal oxide particles have a large specific surface area (e.g.,  $66.8 \text{ m}^2/\text{g}$  in Example 1 and  $69.6 \text{ m}^2/\text{g}$  in Example 2) so that noble metals can be carried and well-dispersed thereon. The results in Table 2 (page 15) of the specification confirm that these larger surface area particles perform unexpectedly better than smaller surface area particles.

Kimura does not remedy the deficiencies of Dransfield. Kimura describes an exhaust gas purifying catalyst that includes, among other elements, a noble metal loaded onto a porous support. The porous support may be alumina, silica, silica-alumina, zirconia or

titania. See claim 3. Kimura thus does not teach or suggest the use of metal oxide particles comprised of ceria and zirconia as in claims 1 and 10 with a noble metal thereon.

Accordingly, Kimura does not teach or suggest including a noble metal on metal oxide particles of ceria and zirconia. Nothing in Kimura would have led one to have included a noble metal on the different ceramic-making metal oxide particles of Dransfield for any reason.

There simply is no teaching or suggestion in either Dransfield or Kimura to have led one to have added a noble metal to the ceramic-making particles of Dransfield, as (1) noble metals are not taught to be necessary to ceramic-making with Dransfield's particles and (2) the ceramic-making particles of Dransfield are not indicated to have utility as exhaust gas purifying catalysts. There is nothing suggesting a reasonable expectation of success in the alleged combination.

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Regarding claims 12-15 and 17-19, the Patent Office argues that Dransfield disclosed the claimed process of preparing the metal oxide particles. Further, the Patent Offices states that while the reference does not specifically recite adjusting the pH of the solution on the basis of isoelectric point of zirconia, it would have allegedly been prima facie obvious to one of ordinary skill in the art at the time the invention was made to have optimized such pH value in the manner claimed because pH is allegedly a result effective variable and involves

only routine experimentation of one having ordinary skill in the art to adjust. Applicant disagrees.

First, the Patent Office has failed to establish that adjusting pH is a result effective variable known to practitioners in the art. Applicant submits that the present application is analogous to *In re Antoine*, 559 F.2d 618 (CCPA 1977), cited in MPEP §2144.05. In *Antoine*, the prior art did not recognize that the treatment capacity of a wastewater treatment device was a function of the ratio of tank volume to contractor area. Therefore, the optimized parameter, the ratio of tank volume to contractor area, was not recognized in the art as a result-effective variable.

In the present application, neither Dransfield nor Kimura mention the isoelectric point of zirconia. Applicant submits that the Patent Office has not produced a reference demonstrating that the pH corresponding to the isoelectric point of zirconia is a result-effective variable for the process presently claimed in claims 12-15 and 17-19 known to one of ordinary skill of the art at the time of the present application.

Second, Applicant has demonstrated that the recited pH achieves unexpected results in Table 2 of the specification. Table 2 shows that catalysts 4 and 5, produced at a pH of 9, performed much more poorly than catalysts 1 and 2, which were produced at a pH of 4. The particles of Dransfield are produced at a pH of 8.5. See Example 1 (col. 5, l. 31-34) of Dransfield. Therefore, Dransfield teaches away from producing particles in an acidic solution. Furthermore, Table 2 shows the particles of the present claims, produced at a pH of 4, have the unexpected result of larger specific surface area than the particles produced at a pH of 9. Applicant has demonstrated that the particles of the present claims are produced in solution at a significantly different pH (acidic versus alkaline) and have unexpectedly higher specific surface area. Applicant submits that the present claims are not obvious from Dransfield and Kimura for this additional reason.

Third, the method of Dransfield is different from the present claims. Dransfield forms the zirconium oxide as the base material by vapor phase oxidation/hydrolysis of a vaporized zirconium compound. After the zirconia particles are prepared by vapor phase oxidation, the formed particles are then treated with the cerium that is applied, for example, as a coating to the already separately formed zirconium particles. Dransfield does not aggregate the zirconia and ceria from a same solution containing both zirconia and ceria together as in present claim 12. Instead, Dransfield separately forms the zirconia and ceria coatings. For example, see column 3, lines 3-28 of Dransfield. As Dransfield applies ceria separately from the already formed zirconia and does not have both the zirconia and ceria together in a same solution, it would not have been obvious to have adjusted the pH as alleged by the Patent Office, nor would doing so have arrived at the claimed method.

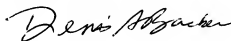
For at least the foregoing reasons, Dransfield and Kimura, singly or in combination, do not teach or suggest the present claims. Reconsideration and withdrawal of this rejection are respectfully requested.

## II. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-10 and 12-19 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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